MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 3, 2021/2022

DBM5614 – MATHEMATICS

(All sections/Groups)

15 AUGUST 2022

9.00 am – 11.00 am

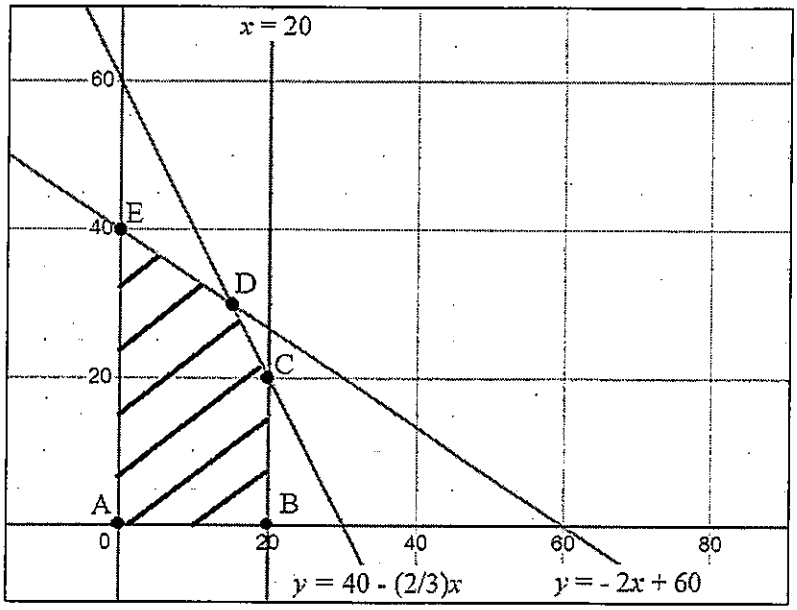
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of **3** pages excluding cover page and appendix.
2. Attempt **ALL FOUR (4)** questions. The distribution of marks for each question is given.
3. Write all your answers in the Answer Booklet provided.
4. Key formulae are given in the Appendix.

Question 1

a) Inesita Electrical company sells x units of android tv and y units of smart tv. The following graph x-y plane summarizes the constraints for the tv selling.



i. List down the constraints (other than $x, y \geq 0$) obtained from the graph. (3 marks)

ii. Prove that the coordinate of point D is (15,30). (5 marks)

iii. Evaluate each of the corner points if the profit for selling each unit of android tv and smart tv is RM3200 and RM4500 respectively. (5 marks)

iv. From answer in part (iii), identify the maximum profit and quantity sold for each item. (2 marks)

b) A kitchenware company manufactures two types of plates; ceramic and porcelain. Three machines are needed for manufacturing the plates. It requires at least 1 hour of machine 1, maximum of 20 minutes of machine 2 and at most 35 minutes of machine 3. The following table describes the data taken from the kitchenware company.

	Ceramic (X)	Porcelain (Y)
Machine 1	5	3
Machine 2	4	2
Machine 3	7	5

i. List the linear inequalities that satisfy the above conditions. (4 marks)

ii. Determine the x and y intercepts for each condition. (6 marks)

[TOTAL 25 MARKS]

Continued...

Question 2

a) Kadir wants to save his money in bank. After searching, he found out that Meibank pays 2.05% compounded monthly and Arbank pays 2.25% per annum compounded quarterly.

i. Find the effective rate of each bank. (4 marks)

ii. Identify which bank offers a better return to him. (1 mark)

b) Calculate the future value annuity of RM700 per month for 7 years with interest paid monthly at an annual rate of 4.2%. (5 marks)

c) Zeynep is considering buying a car. She managed to shortlisted her car preferences from carsem.com as shown in the following table.

	New Car	**Used Car**
Model	Iriz 1.6 L Active CVT	Iriz 1.6 L A
Selling price	RM54,800	RM40,800
Registered year	2022	2022
Bank	CIMB	BSN
Loan period	9 years	5 years
Interest rate	2.85%	3.50%
Type of interest	Simple interest	Compounded monthly

i. Based on the table above, calculate the loan amount for each cars if 10% deposit is charged from the selling price. (4 marks)

ii. Compute the interest charged by CIMB with simple interest rate. (2 marks)

iii. How much Zeynep needs to pay CIMB in total? (1 mark)

iv. From answer in part (iii), calculate the monthly payment for new car. (2 marks)

v. Find the monthly payment for used car. (5 marks)

vi. After considering the monthly payment for both cars, which car is worth to buy? (1 mark)

[TOTAL 25 MARKS]

Continued...

Question 3

a) Given $y = 27e^x - 27 + \frac{\ln x}{27} - 27x + 27\pi$.

i. Find y' and y''. (8 marks)

ii. Hence, evaluate $y'(1) - y''(1)$. Round off your answer to the nearest whole number. (3 marks)

b) Use **Product Rule** to differentiate $f(t) = (4t^3 + 5)(7 - 8t^2)$. (5 marks)

c) Given a function: $y = \frac{1}{(3x^2+7)^{2022}}$

i. Find $\frac{dy}{dx}$ by using **Chain Rule**. (5 marks)

ii. From answer in part (i), identify the value of m and n if $\frac{dy}{dx} = \frac{mx}{(3x^2+7)^n}$. (2 marks)

d) Evaluate the marginal cost function of $\frac{dc}{dq} = 30.30q^2 + 30\sqrt{q}$ when $q = 36$. (2 marks)

[TOTAL: 25 MARKS]

Question 4

a) Find the indefinite integral of $\int \left(\sqrt{78} + \frac{7}{8x} - \frac{7e^{7x}}{8} - 7x^8\right) dx$. (5 marks)

b) Solve $\int 2x(3x^2 - 2022)^5 dx$ by using **Substitution Rule**. (7 marks)

c) Given that $\int_2^4 g(x)\,dx = 245$. Find the value of w if $\int_2^4 g(x)\,dx + \int_0^5 w\,dx = 555$. (6 marks)

d) It is found that marginal-revenue function for a company that produces x units of adapter is $R'(x) = 1.5x^3 + 0.15x - 15$.

i. Determine the total-revenue function, $R(x)$. (4 marks)

ii. Hence, calculate the total revenue from 10 to 20 units. (3 marks)

[TOTAL 25 MARKS]

End of Paper.

APPENDIX – FORMULAE

Effective Rate	
$r_e = \left(1+\frac{r}{n}\right)^n - 1$	
Simple Interest $I = Prt$	**Future Value** $FV = PV\left(1+\frac{r}{n}\right)^{n\times t}$
Present Value Annuity $A = R\left[\frac{1-\left(1+\frac{r}{n}\right)^{-n\times t}}{\frac{r}{n}}\right]$	**Future Value Annuity** $S = R\left[\frac{\left(1+\frac{r}{n}\right)^{n\times t}-1}{\frac{r}{n}}\right]$

Derivatives

1. $\frac{d}{dx}\left(ax^n\right) = anx^{n-1}$	2. $\frac{d}{dx}[g(x)]^n = n[g(x)]^{n-1}\cdot g'(x)$
3. $\frac{d}{dx}[f(x)g(x)] = f(x)g'(x)+g(x)f'(x)$	4. $\frac{d}{dx}\left[\frac{f(x)}{g(x)}\right] = \frac{g(x)f'(x)-f(x)g'(x)}{[g(x)]^2}$

Logarithmic Functions	Exponential Functions	Chain Rule
$\frac{d}{dx}(\ln x) = \frac{1}{x}$	$\frac{d}{dx}\left(e^x\right) = e^x$	$\frac{dy}{dx} = \frac{dy}{du}\cdot\frac{du}{dx}$
$\frac{d}{dx}\ln u = \frac{1}{u}\cdot\frac{du}{dx}$	$\frac{d}{dx}e^u = e^u\frac{du}{dx}$	

Integration

1. $\int k dx = kx + C$	2. $\int ax^n dx = \frac{ax^{n+1}}{n+1} + C, \quad n \neq -1$
3. $\int e^x dx = e^x + C$	4. $\int \frac{1}{x} dx = \ln x + C$
Definite Integral, $A = \int_a^b f(x)\,dx = F(b) - F(a)$	